

Claims

1. A communications network comprising:-
 - (a) a plurality of switching nodes,
 - 5 (b) a plurality of network spans each comprising a working span and a protection span and arranged to interconnect the switching nodes in a ring configuration,
 - (c) a network controller arranged to control switching of data in the network between the working and protection spans,
 - 10 the network being arranged to carry working data on the working spans and a portion of working data on the protection spans, the portion carried on the protection span having a bandwidth less than the maximum bandwidth of the protection spans, and the network controller being arranged in the event of a failure in a working span, to cause the switches to perform a span switch by
 - 15 switching a portion of the working data bandwidth being carried on the working span to the unused bandwidth on the protection span for the span having the working span failure and to perform a ring switch by switching the remainder of the working data bandwidth carried on the working span to the unused bandwidth on the protection spans of the other spans in the ring, the network
 - 20 controller being further arranged in the event of a failure in a protection span to cause the switches to perform a ring switch to switch the portional bandwidth of the working data to the unused bandwidth on the protection spans of the other spans in the ring.
- 25 2. A network according to claim 1, wherein the network controller is integral with at least one of the switching nodes.
3. A network according to claim 1, wherein the spans are carried over optical fibres.
- 30 4. A network according to claim 1, wherein the data is transmitted over the network using a protocol selected from a group containing SONET and SDH.

080405-062001

5. A network according to claim 1, wherein the bandwidth on the protection spans not used for working data before a failure in a working span is at least half the maximum bandwidth of the protection spans.
- 5 6. A network according to claim 1, wherein the bandwidth on the protection spans not used for working data before a failure in a protection span is at least half the maximum bandwidth of the protection spans.
- 10 7. A network controller for a ring-configured communications network, each span in the network having a working span and a protection span, the network controller being arranged to cause the network to carry working data on the working spans and a portion of working data on the protection spans, the portion carried on the protection span having a bandwidth less than the maximum bandwidth of the protection spans, and the controller being further
15 arranged to control the protection switching function of at least one switching node in the network, and in the event of a failure in a working span, to cause the or each switching node to perform a span switch by switching a portion of the working data bandwidth to the unused bandwidth on the protection span for the span having the working span failure and to perform a ring switch by
20 switching the remainder of the working data bandwidth to the unused bandwidth on the protection spans of the other spans in the ring, the network controller being further arranged in the event of a failure in a protection span to cause the or each switching node to perform a ring switch to switch the portion
25 bandwidth of the working data to the unused bandwidth on the protection spans of the other spans in the ring.
8. A network controller according to claim 7, wherein the network controller forms an integral of at least one switching node in the network.
- 30 9. A network controller to claim 7, wherein the bandwidth on the protection spans not used for working data before a failure in a working span is at least half the maximum bandwidth of the protection spans.

10. A network controller to claim 7, wherein the bandwidth on the protection spans not used for working data before a failure in a protection span is at least half the maximum bandwidth of the protection spans.
- 5 11. A switching node for a ring-configured communication network, the node being arranged to permit the network to carry working data on the working spans and a portion of working data on the protection spans, the portion carried on the protection span having a bandwidth less than the maximum bandwidth of the protection spans, and the node being operable to switch data onto and between
 - 10 protection and working spans connected to the node, the node being further operable to perform a span switch by switching a portion of the working data bandwidth to the unused bandwidth on the protection span for the span having the working span failure and to cooperate with other switching nodes in the network to perform a ring switch by switching the remainder of the working data
 - 15 bandwidth to the unused bandwidth on the protection spans of the other spans in the ring.
12. A node according to claim 11, wherein the bandwidth on the protection spans not used for working data before a failure in a working span is at least half the
 - 20 maximum bandwidth of the protection spans.
13. A node according to claim 11, wherein the bandwidth on the protection spans not used for working data before a failure in a protection span is at least half the maximum bandwidth of the protection spans.
- 25 14. A method of transmitting data over a communications network, the network having a plurality of switching nodes interconnected in a ring configuration, and each network span having a protection span and a working span, the method comprising:-
 - 30 (a) transmitting working data over each working span at a bandwidth up to the maximum bandwidth of the working span,
 - (b) transmitting working data over each protection span at a portion bandwidth which is less than the maximum bandwidth of the protection span,

- (c) in the event of a failure in a working span, performing a span switch by switching a portion of the working data bandwidth to the unused bandwidth on the protection span for the span having the working span failure and performing a ring switch by switching the remainder of the working data bandwidth to the unused bandwidth on the protection spans of the other spans in the ring,
- (d) In the event of a failure in a protection span, performing a ring switch by switching the portional bandwidth of the working data to the unused bandwidth on the protection spans of the other spans in the ring.

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15. A method according to claim 14, wherein the bandwidth on the protection spans not used for working data before a failure in a working span is at least half the maximum bandwidth of the protection spans.

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16. A method according to claim 14, wherein the bandwidth on the protection spans not used for working data before a failure in a protection span is at least half the maximum bandwidth of the protection spans.